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(58) Field of search
E1G

(54) **Sound-reducing track structure**

(57) A sound-reducing track structure is installed between a rail (20) and its m unting and the associated substructure (1) such as a bridge or tunnel bed. A sound-insulating elastic intermediate layer (5) is provided between the part (7) connected with the rail (20) which is a core with considerable mass and the part (4) connected with the substructure (1) which is a trough (4) for accommodating the core. The core can be constructed as a steel-encased concrete sleeper or as a steel sleeper.

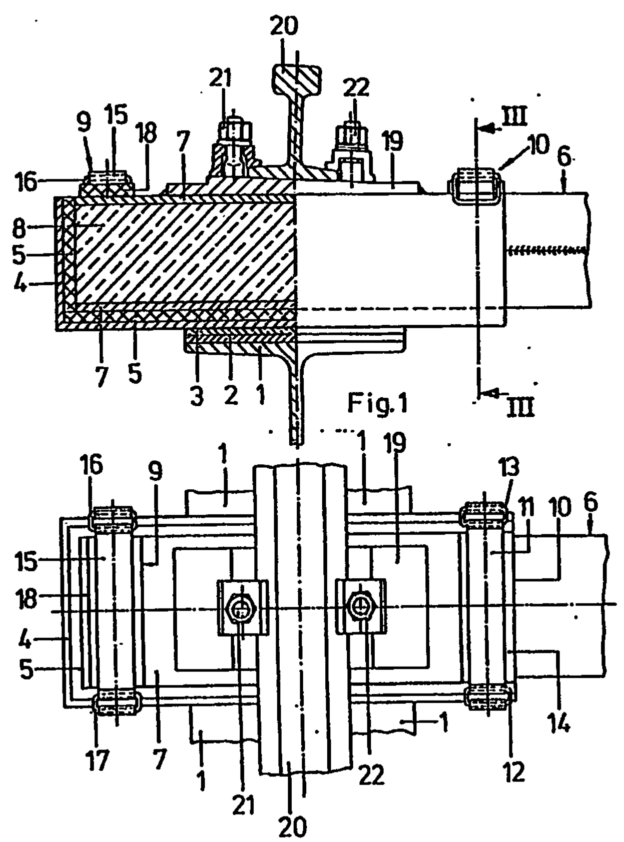

Fig.1

Fig.2

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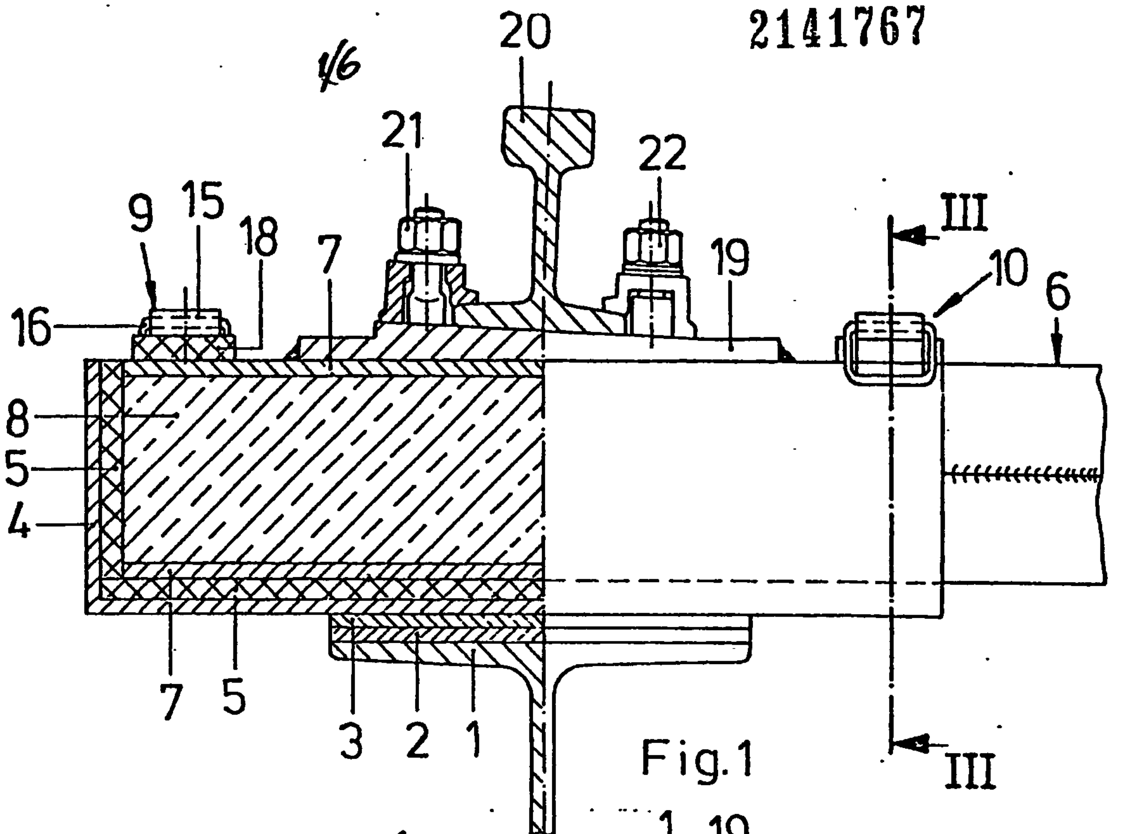

Fig.1

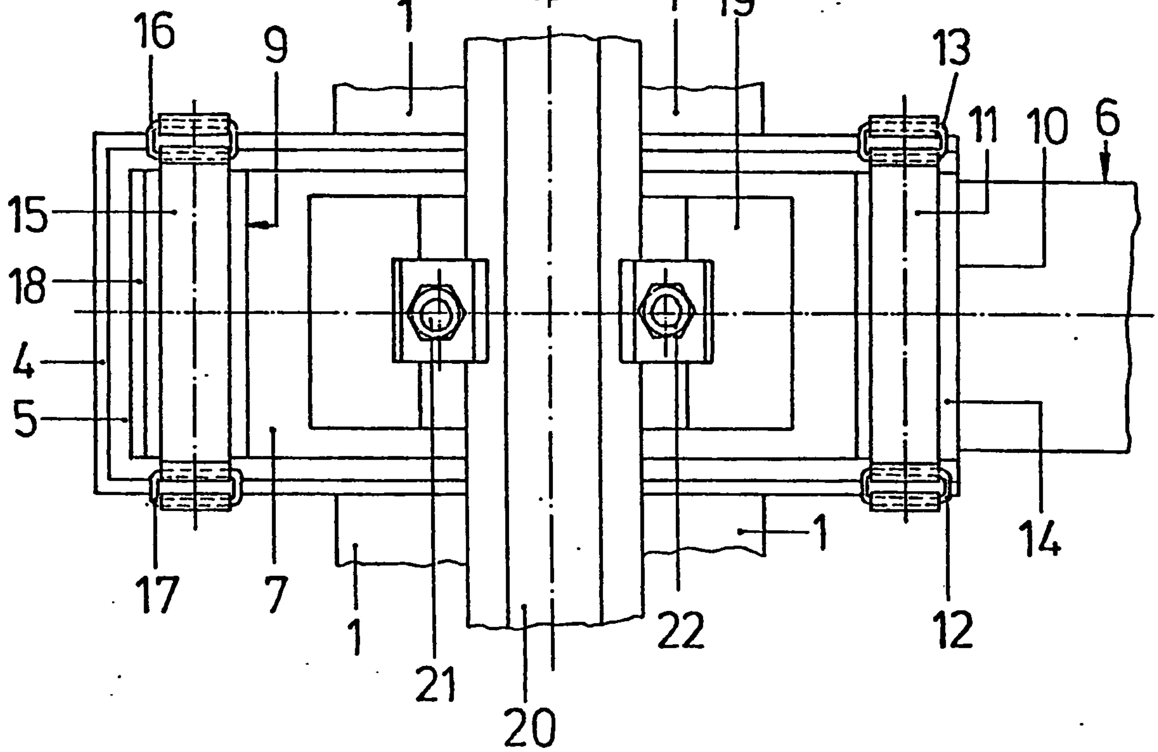

Fig.2

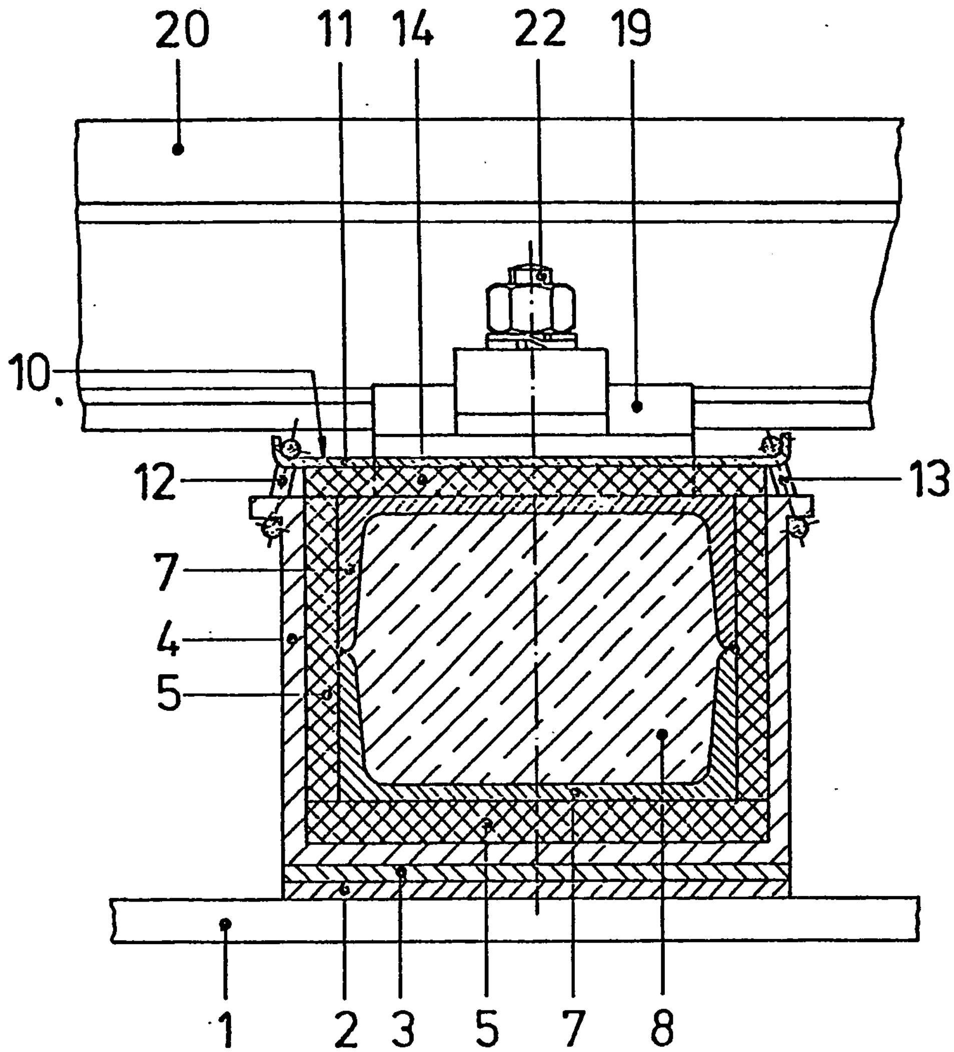

Fig. 3

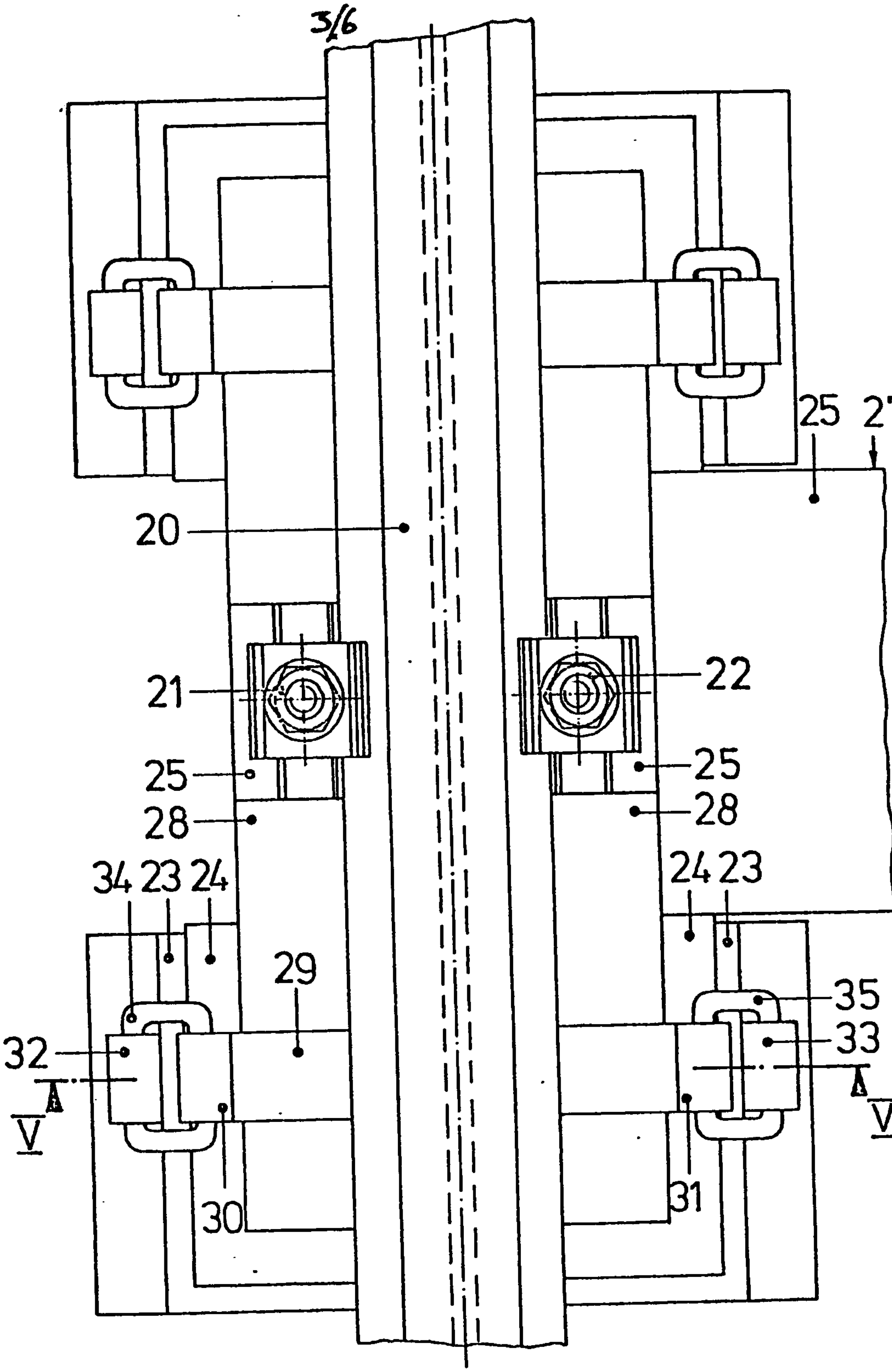

Fig. 4

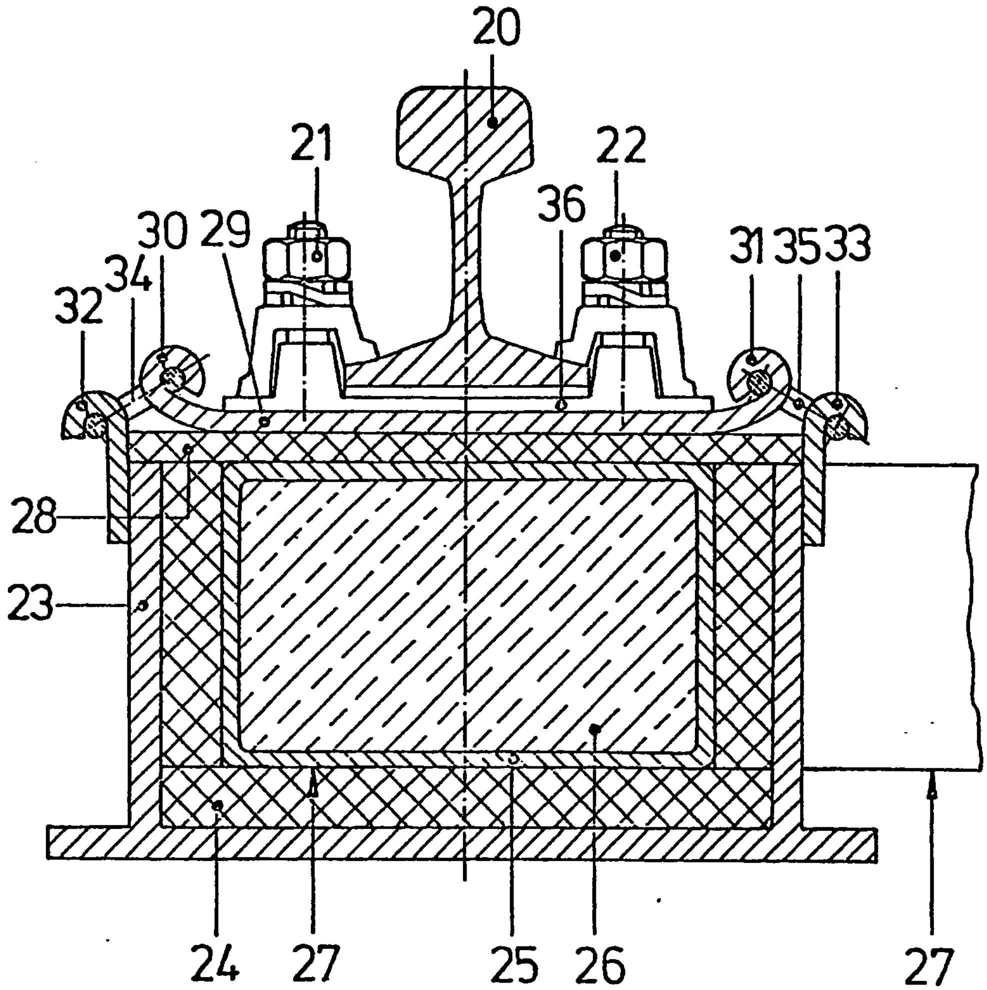

Fig. 5

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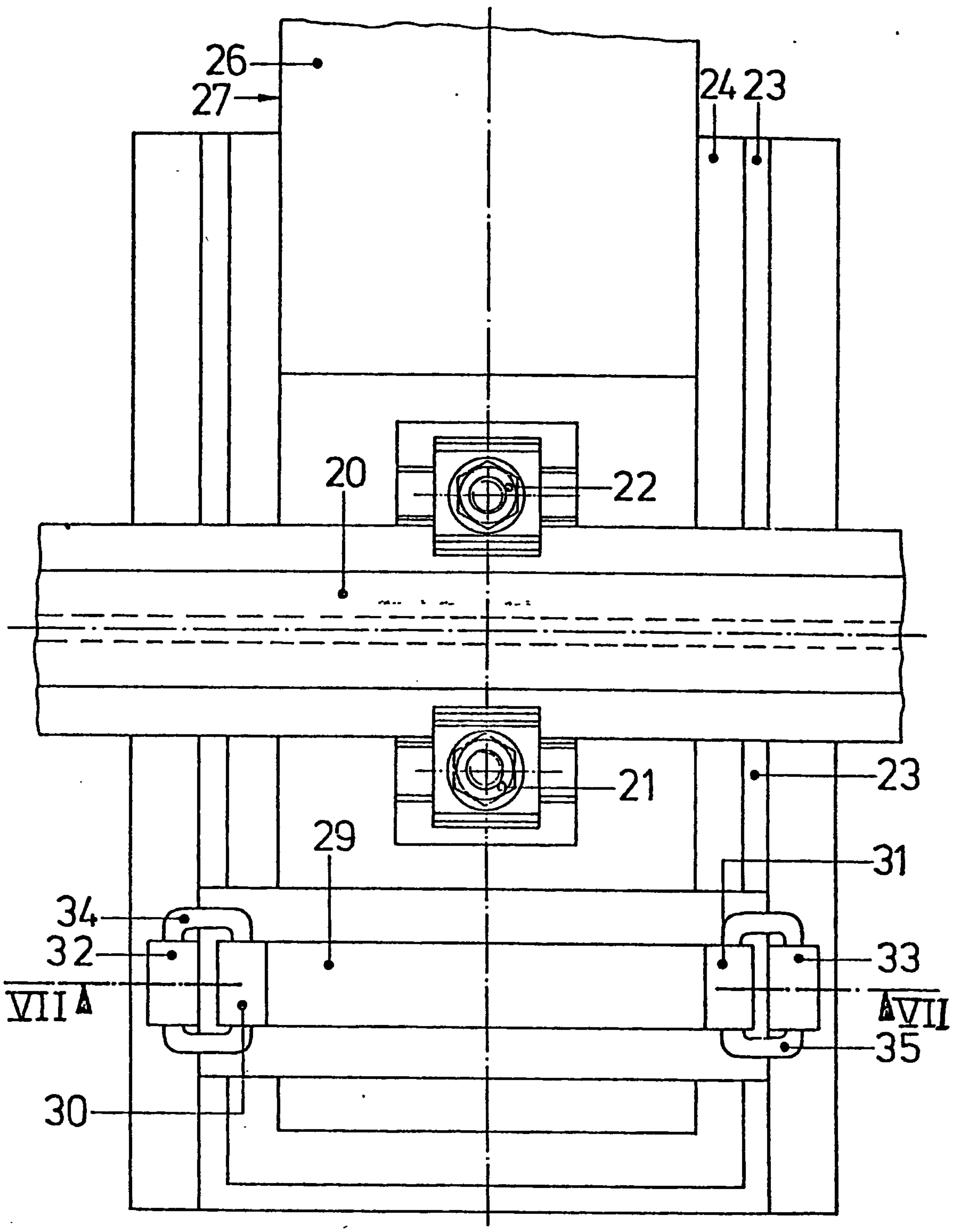

Fig. 6

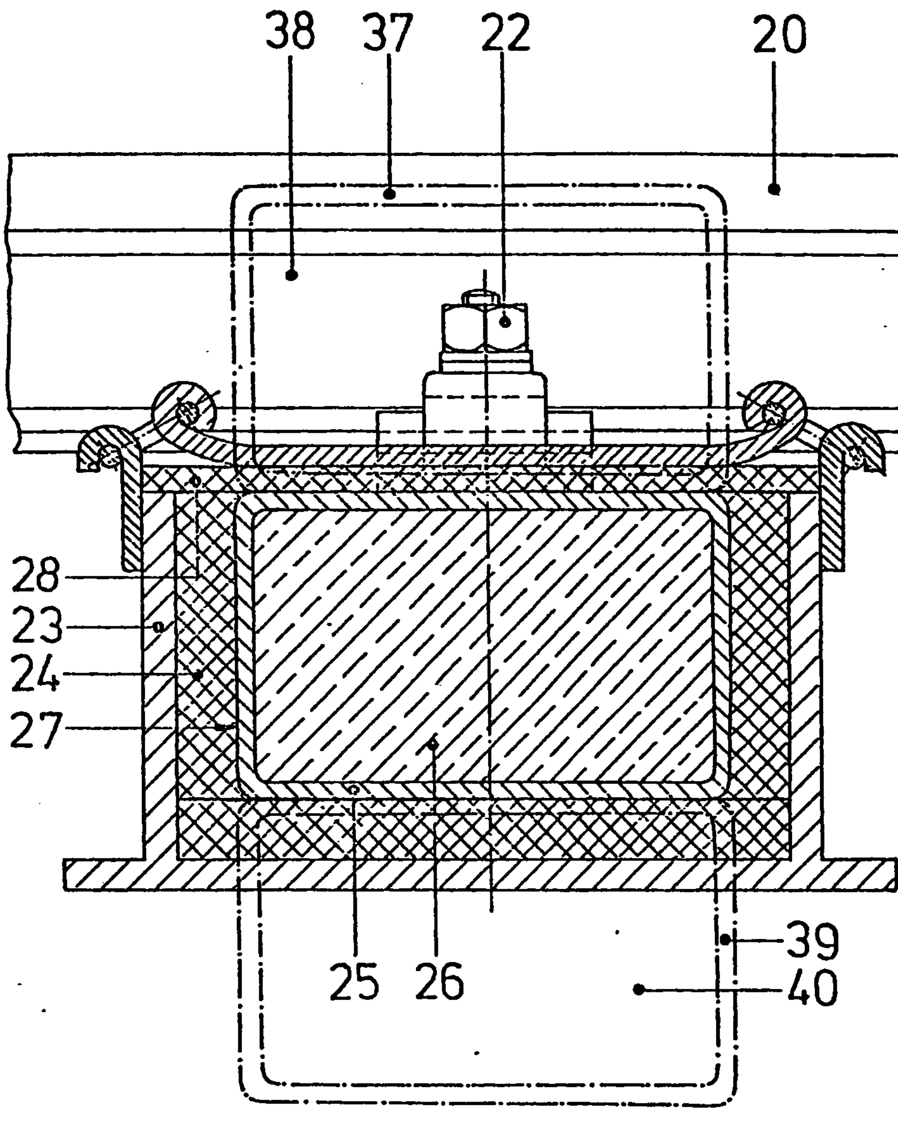

Fig. 7

SPECIFICATION

S und-reducing track structure

Th invention relates to a sound-reducing track structure for installation between the rail and its mounting and also the associated substructure, comprising a part connected with the rail and a part connected with the substructure, and a sound-insulating elastic intermediate layer is provided between the two parts.

In the case of steel railway bridges for main lines and surburban lines, the substructure consists of the bridge longitudinal members and in the case of tunnels of the tunnel bed.

In the case of steel railway bridges, the airborne sound emission is particularly strong within the frequency ranges of from 100 to 500 Hz. In known bridges, the wooden bridge sleepers are placed directly on the bridge longitudinal members. Howev-r, only a very slight reduction in air-borne sound emission is thereby achieved.

Since greater masses are necessary for sound insulation, the idea is currently still prevalent that airborne sound emission is particularly favourable on particularly heavy bridges, namely on concrete bridges with continuous ballast bed.

To insulate solid-borne sound in tunnels a rail mounting has been developed which comprises a part connected with the tunnel bed, on which part there is mounted a part connected with the rail. A sound-insulating elastic intermediate layer is provided between the two parts. The sound conducted from the rail into the part of the rail mounting connected with the rail is thereby absorbed in the lastic intermediate layer.

The subject of this invention is a sound-reducing track structure of the initially indicated type, which makes possible particularly effective acoustic isolation of the track grid and substructure. The structure is intended to be used for sound reduction in main line and suburban steel railway bridges, and also in tunnels, and in particular underground railway and elevated railways.

According to the invention, the part connected with the rail is designed as a core with considerable mass and the part connected with the substructure is designed as a trough for accommodating the core.

A sound-reducing track structure is thereby provided with which it is possible for airborne sound emission within the frequency ranges of from 100 to 500 Hz to be prevented particularly effectively. This track structure can be used for existing bridges and f r new bridges. Moreover, the track structure can be used for the types of bridge without a ballast bed with the wooden bridge sleepers directly supported on the longitudinal members of the bridges, i.e. for solid-web girder bridges, box-type bridges and truss bridges.

Advantageously, the core is constructed as a steel-encased concrete sleeper or as a steel sleeper. This means that a sleeper of this type is of low w ight; moreov r, such sleepers can be used to replace w od n sleepers on existing bridges. Furthermore, they are considerably lighter than mass-spring systems. They are also lighter than additi nal sound absorbers. An additional advantage is the ease with which they can be exchanged for bridge sl epers on existing bridges.

Th durability of such sl epers is equal to that f the track on bridges and in tunnels. Furthermore, the track structure is particularly resistant to corrosion.

Preferably the trough and the sound-insulating intermediate layer are provided only in the vicinity of the rail. The core can be desinged as a continuous sleeper which comprises a hollow section filled with concrete. The mass can be also increased by constructing the core in cast iron or concrete with a filler of scrap or waste material.

Preferably the sleeper is held in the trough by means of a retaining device, a sound-insulating elastic intermediate layer being provided between the retaining device and the trough.

Furthermore, the track structure can be laid in the longitudinal direction of the rail and, in each case, two track structures situated mutually opposite can be connected with each other by a steel-encased concrete sleeper.

Advantageously, when used on bridges, the track structures are arranged on the bridge longitudinal members.

When using the track structure in tunnels, the space between the sleeper and the rail upper edge, as well as between the sleeper and the tunnel bed, can be filled up with hollow members filled with concrete. By this means, the track element thereby receives greater mass than is necessary on bridges. Accordingly, this results in a distinct decrease in solid-borne sound emission within the frequency range of from 10 to 25 Hz.

Embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, of which:

Figure 1 shows a partly sectional view of a first embodiment of a track structure according to the invention;

Figure 2 shows a plan view of the track structure according to Figure 1;

Figure 3 shows a section along the line III-III in Figure 1;

Figure 4 shows a plan view of a second embodiment;

Figure 5 shows a section along the line V-V in Figure 4;

Figure 6 shows a plan view of a third embodiment; and

Figure 7 shows a section along the line VII-VII in Figure 6.

According to a first embodiment of the invention, Figures 1 to 3 illustrate a sound-reducing track structure which is intended for use on main line and suburban steel railway bridges. A trough 4 is disposed on a bridge longitudinal member 1 with metal packing plat s 2 and 3 interposed, which trough 4 is lined internally with a sound-insulating elastic intermediate lay r 5. Inside the trough 4 lined with the elastic intermediat lay r 5 there is mounted a sleeper 6 which consists of a steel hollow section 7 with a filling f concret 8. Th sle per 6 is prevented from dropping out of the tr ugh 4 by two

retaining devices 9 and 10. Th retaining device 10 comprises a leaf spring 11 which is connected with the trough 4 *via* buckles 12 and 13. A s und-insulating elastic intermediate layer 14 is provid d between th leaf spring 11 and the trough 4 and als the hollow section 7.

The other retaining device 9 is designed in the same manner as the retaining device 10. A leaf spring 15 is connected at both its ends with the trough 4 *via* buckler 16 and 17. A sound-insulating intermediate layer 18 is provided between the leaf spring 15 and the hollow section 7.

A ribbed plate 19 is welded to the hollow section 7 and a rail 20 is bolted to this ribbed plate by means of bolts 21 and 22.

In the embodiment illustrated in Figures 4 and 5, the sound-reducing track structure is laid in the longitudinal direction of the rail 20. A trough 23, which is mounted on a bridge longitudinal member (not shown in detail), is lined with a sound-insulating elastic intermediate layer 24. A hollow section 25 filled with concrete 26 is mounted on the intermediate layer 24. The hollow section 25 together with the concrete 26 forms the sleeper 27.

On the hollow section 25, a spring 29 is arranged as retaining device on a sound-insulating elastic intermediate layer 28, which spring terminates at both ends in eyes 30 and 31. Opposite the eyes 30 and 31, hooks 32 and 33 are secured to the trough 23, in which case a buckle 34 is arranged between the eye 30 and the hook 32 and a buckle 35 is arranged between the eye 31 and the hook 33. The part of the sound-reducing track element lying at the other end of the sleeper is constructed in the same manner as described above.

The rail 20 is secured on a ribbed plate 36 on the hollow section 25, by means of the bolts 21 and 22.

The sound-reducing track structure illustrated in Figures 6 and 7 is particularly suitable for tunnel sleepers. Here too, as in the above-described embodiments, a sleeper 27 is mounted in a trough 23 which is lined internally with a sound-insulating elastic intermediate layer 24, which sleeper consists of a hollow section 25 filled with concrete 26. In order to be able to provide the relatively great mass necessary for reducing solid-borne sound emission in the frequency range of from 10 to 25 Hz, the space between the sleeper 27 and the upper edge of the rail 20 is filled up with a further hollow section 37 filled with concrete 38. In addition, the space between the sleeper 27 and the tunnel bed is filled up with a hollow member 39 also filled with concrete 40.

CLAIMS

1. A sound-reducing track structure for installation between a rail and its mounting and also the associated substructure, comprising a part connected with the rail and a part connected with the substructure, and a sound-insulating elastic intermediate layer provid d between the two parts, wherein the part connected with the rail is d signed as a cor with consid rable mass and the part connected with the substructure is designed as a tr ugh for accommodating the core.

2. A sound-reducing track structure according to claim 1, wher in the core is constructed as a steel-encased concrete sl eper or as a steel sleep r.

3. A sound-reducing track structure according to claim 1 r claim 2, wherein the trough and the sound-insulating intermediate layer are provided only in the vicinity of the rail.

4. A sound-reducing track element according to one or more of claims 1 to 3, wherein the core is designed as a continuous sleeper which comprises a hollow section filled with concrete.

5. A sound-reducing track structure according to one or more of claims 1 to 4, wherein the sleeper is held in the trough by means of a retaining device, a sound-insulating elastic intermediate layer being provided between the retaining device and the trough.

6. A sound-reducing track structure according to one or more of claims 1 to 5, wherein the track structure is laid in the longitudinal direction of the rail and, in each case, two track structures situated mutually opposite are connected with each other by a steel-encased concrete sleeper.

7. A sound-reducing track structure according to one or more of claims 1 to 6, wherein, when used on bridges, the track structures are arranged on the bridge longitudinal members.

8. A sound-reducing track structure according to one or more of claims 1 to 7, when using the track structures in tunnels, the space between the sleeper and rail upper edge, as well as between the sleeper and the tunnel bed, is filled up with hollow members filled with concrete.

9. A sound-reducing track structure substantially as herein described with reference to and as shown in Figures 1, 2 and 3, or with reference to and as shown in Figures 4 and 5, or with reference to and as shown in Figures 6 and 7 of the accompanying drawings.

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